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New records of *Lepraria* and *Trapelia* from China

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Abstract—As a result of our study on the lichen flora of Guizhou Province in China, *Lepraria caesiella*, *L. pallida* and *Trapelia placodioides* are reported for the first time from China, and *Lepraria. cupressicola* is reported for the first time from Guizhou Province.

Key words—taxonomy, lichenized fungi, Asia

Introduction

Guizhou Province lies in the Yungui Plateau, located in the southwestern part of China. The climate is warm and moist with an annual temperature ranging from 14 to 16 °C. Terrain in this hilly province has an average elevation of 1100 m. Annual precipitation averages 1200 mm and mostly occurs during the summer (June–September). There is little information available regarding the current occurrence of lichens in Guizhou. The purpose of this paper is to provide new distributional information for lichen taxa in Jiangkou, Dejiang, and Leishan counties in Guizhou Province.

Lepraria Ach. was described for sterile lichens. Laundon (1989, 1992) revised the concept of *Lepraria* to comprise lichen-forming fungi with leprose thalli that never develop fruiting bodies. More recently Lendemer & Hodkinson (2013) revised *Lepraria*, using molecular phylogenetic analyses and morphology. Although the modern circumscription of *Lepraria* essentially follows that of Laundon (1989, 1992) morphologically, it now also

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includes several sterile fruticose species historically placed in *Leprocaulon* Nyl (Lendemer & Hodkinson 2013). Similarly, some species with unusual chemistries such as argopsin, pannarin, and usnic acid that were originally placed in *Lepraria* were shown to belong to other lineages in the *Ascomycetes* (Lendemer & Hodkinson 2013). Importantly Lendemer (2011) also introduced a standardized morphological terminology and descriptive scheme that should facilitate specimen identification and description preparation.

In this study, *Lepraria caesiella*, *L. pallida,* and *Trapelia placodioides* are reported for the first time from China, and *Lepraria cupressicola* is reported for the first time from Guizhou Province.

Materials & methods

The specimens were collected in Guizhou Province, China, and are preserved in Lichen Section of the Botanical Herbarium, Shandong Normal University, Jinan, China (SDNU). The specimens were examined morphologically under a COIC XTL7045B2 stereo-microscope and an Olympus CX41 polarizing microscope. Thallus and medulla were identified by testing with K (a 10% aqueous solution of potassium hydroxide), C (a saturated solution of aqueous sodium hypochlorite), and P (a saturated solution of *p*-phenylenediamine in 95% ethyl alcohol). The lichen substances were identified using standardized thin layer chromatography techniques (TLC) with system C (Orange et al. 2001). The lichens were photographed using Olympus SZX16 and BX61 with DP72.

Taxonomy

Lepraria caesiella R. C. Harris, Opusc. Philolich 2: 51 (2005) FIG. 1A

MORPHOLOGY—Thallus crustose, leprose, aggregated, discontinuous and not stratified, whitish green to pale bluish grey, initially consisting of isolated granules, eventually merging to form a thin crust (<0.1 mm thick); hyphae hyaline, 25–30 µm long, septate secund, obscured by a thick layer of crystals that dissolve in KOH and recrystallize as thin bent needles, with a few surrounding the granules and anchoring the granules to each other tightly; prothallus absent; hypothallus absent; rhizohyphae absent. Granules globose, ecorticate, (20–)50(–70) µm diam., well organized and discrete, remaining distinct and not forming compound units. Photobiont green, coccoid, cells globose, 7.5–12.5µm diam. Substrate acid rock in sheltered microhabitats.

CHEMISTRY—Cortex and medulla K+ yellow, C+ yellow, KC+ yellow. Atranorin and zeorin detected by TLC.

DISTRIBUTION—North and South America, Greenland, South Korea, Canada, Low Arctic (Saag et al. 2007, 2009; Joshi et al. 2010; Lendemer 2012, 2013a). New to China.

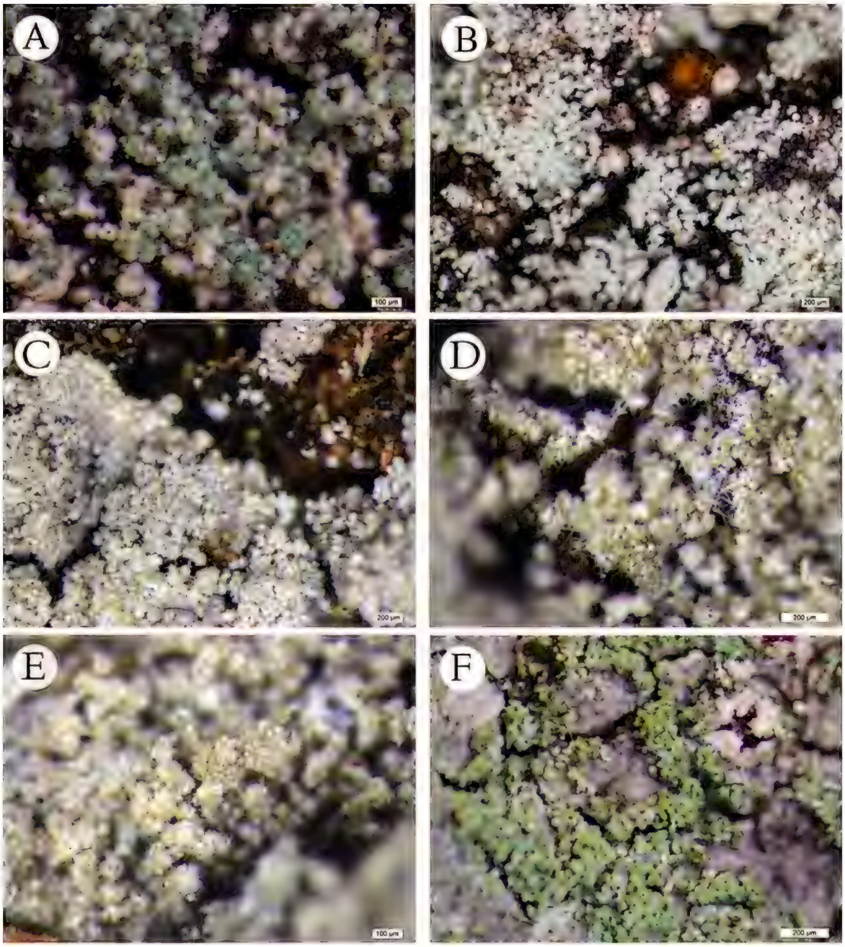

Fig. 1. A, *Lepraria caesiella*; B. *Lepraria cupressicola*; C. *Lepraria pallida,* D, E. Granules of *L. pallida*; F. *Trapelia placodioides*. Scale bars: A, E = 100 µm; B–D, F = 200 µm.

Specimen examined: **CHINA. Guizhou**, Jiangkou, Jiangxicun, 27°32′31″N 108°34′59″E, alt. 695m, on rock, 3 Apr. 2016, X.X. Zhao 20160898 (SDNU).

Comments—*Lepraria caesiella* is chemically similar to *L. harrisiana* Lendemer, which is morphologically distinguished by a *cryophila*-type placodioid thallus (Lendemer 2013a). *Lepraria elobata* Tønsberg and *L. neglecta* (Nyl.) Erichsen also share morphological similarities, but *L. elobata* produces salazinic acid or stictic acid in addition to atranorin and zeorin while *L. neglecta* produces stictic acid in the zeorin-producing chemotypes (Lendemer 2013b). *Lecanora nothocaesiella* Lendemer & R.C. Harris, a sorediate member of the *Lecanora subfusca* group with *allophana*-type apothecia, differs from *L. caesiella* in not producing a truly leprose thallus (Lendemer 2011).

Lepraria cupressicola (Hue) J.R. Laundon, Lichenologist 40: 412 (2008) FIG. 1B

= *Lepraria atrotomentosa* Orange & Wolseley, Biblioth. Lichenol. 78: 328 (2001)

MORPHOLOGY—Thallus crustose, leprose, placodioid, continuous thalli or sometimes diffuse, pale whitish grey to greenish grey, consisting of loosely to densely packed granules with a softened margin; hyphae hyaline, 20–40 µm long, few to abundant surrounding the granules, anchoring the granules tightly to one another and loosely to the substrate; prothallus absent; hypothallus present, usually forming a thin continuous layer underneath the granules and extending outward from the edge of the thallus; rhizohyphae present, pale to black. Granules globose, aggregated, 100–120 µm diam., abundant. Photobiont green, ±spherical, 7.5–15 µm diam. Substrate bark.

CHEMISTRY—Cortex and medulla K+ yellow, C+ red, KC–, Pd+ pale yellow. Atranorin, zeorin, lecanoric acid (minor), roccelic/angardianic acid (minor) detected by TLC.

DISTRIBUTION—Australia, China (Hong Kong, Taiwan), Sri Lanka, Japan (Saag et al. 2009, McCarthy & Kuchlmayr 2009). New to Guizhou Province.

SPECIMEN EXAMINED: CHINA. GUIZHOU, Dejiang, Jingangling, 28°10′15″N 107°51′39″E, alt. 1100m, on bark, 26 May. 2016, X.X. Zhao & W.C. Wang 20160867 (SDNU).

COMMENTS—*Lepraria impossibilis* Sipman and *L. pallida* are morphologically similar to *L. cupressicola*, but do not produce lecanoric acid (Saag et al. 2009). We accept the synonymy of *L. atrotomentosa* under *L. cupressicola* (Laundon 2008, Saag et al. 2009).

Lepraria pallida Sipman, Herzogia 17: 31 (2004) FIG. 1C–E

MORPHOLOGY—Thallus crustose, leprose, placodioid, continuous thalli with rather thin layer, cream white to pale grey, consisting of densely packed granules with a softened and delimited margin; hyphae hyaline, 20–40(–60) µm long, none surrounding the granules, anchoring the granules to each other tightly; prothallus absent; hypothallus present, usually forming a thin continuous layer underneath the granules and extending outward from the edge of the thallus; rhizohyphae absent. Granules ± globose, usually inserted into the hypothallus, 120–300 µm diam., abundant. Photobiont green, spherical or globose, 8–10 µm in diam. Substrate bark.

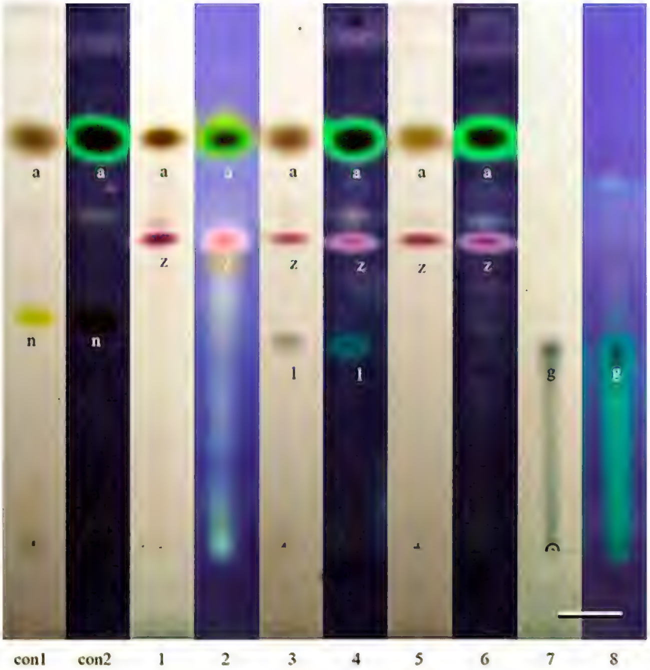

FIG. 2. TLC chromatograms (in solvent C): con1, con2. *Lethariella cladonioides*; 1, 2. *Lepraria caesiella*; 3, 4. *Lepraria cupressicola*; 5, 6. *Lepraria pallida*; 7, 8. *Trapelia placodioides*. Conditions of observation: con1, 1, 3, 5, 7; visible light, after heating; con2, 2, 4, 6, 8, UV365, after heating. Compounds detected: a = atranorin; g = gyrophoric acid; l = lecanoric acid; n = norstictic acid; z = zeorin. Scale bar = 10 mm.

CHEMISTRY—Cortex and medulla K+ yellow, C–, KC–, Pd+ yellow. Atranorin, zeorin, unidentified fatty acids (minor) detected by TLC.

DISTRIBUTION—South America, Africa, South Korea (Saag et al. 2009, Joshi et al. 2010). New to China.

SPECIMEN EXAMINED: CHINA. GUIZHOU, Kaili, Leishan, Leigongshan, alt. 2100m, on bark, 1 Apr. 2011, D.F. JIANG 20112243 (SDNU).

COMMENTS—*Lepraria pallida* is chemically similar to *L. lobata* Elix & Kalb, which differs by its greener colour and its gray to black hypothallus (Joshi et al. 2010).

Trapelia placodioides Coppins & P. James, Lichenologist 16: 257 (1984) FIG. 1F

MORPHOLOGY—Thallus crustose, closely appressed, cracked in the center, margin placodioid, areoles forming, with a rough surface, 0.2–0.5(–0.6) mm diam., whitish to grey. Soralia numerous, 0.2–0.3 mm diam., usually developing from sides of areolae or from cracks in the thallus and then spreading more widely over large, flat thalli, pale greenish white or pale creamy; soredia 20–30 µm diam., farinose to somewhat granular. Apothecia 0.2–0.8 mm diam., rose-pink to red-brown, black when dry; thalline exciple thin, white, smooth to crenate, ± forming a halo-like rim, at least when young. Ascospores 15–25 × 7–13µm. Substrate rock.

Chemistry— Thallus and soralia C+ red, K–, KC–. Gyrophoric acid detected by TLC.

Distribution—Europe, North America and New Zealand (Coppins & James 1984, Foucard 1990, Nimis 1993, Kondratyuk et al. 1996, Brodo et al. 2001, Santesson et al. 2004, Sérusiaux et al. 2004, Purvis et al. 2009, Esslinger 2011, Galloway & Ledingham 2012). New to China.

Specimens examined: **CHINA. Guizhou**, Jiangkou, Xiaodingshan, 27°32′53″N 108°34′55″E, alt. 900m, on rock, 4 Apr. 2016, X.X. Zhao 20160212, 20160213 (SDNU).

Comments—*Trapelia placodioides* is characterized by its saxicolous habit, its whitish, spreading, areolate-cracked to continuous thallus, pale greenish white to whitish soralia developing at first from margins of areolae and thallus cracks but later becoming confluent, and gyrophoric acid (C+ red) in the medulla and soralia (Coppins & James 1984). It is morphologically similar to *T. coarctata* and *T. glebulosa*, which have the same apothecial characteristics and white thallus, but lack soralia (Purvis et al. 2009).

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